National Institute of Environmental Health Sciences

Evaluating the relative impact of climate and economic changes on forest and agricultural ecosystem services in mountain regions

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Year: 2013
Journal: Journal of Environmental Management. 129: 414-422

Abstract:

Provisioning of ecosystem services (ES) in mountainous regions is predicted to be influenced by i) the direct biophysical impacts of climate change, ii) climate mediated land use change, and iii) socioeconomic driven changes in land use. The relative importance and the spatial distribution of these factors on forest and agricultural derived ES, however, is unclear, making the implementation of ES management schemes difficult. Using an integrated economic-ecological modeling framework, we evaluated the impact of these driving forces on the provision of forest and agricultural ES in a mountain region of southern Switzerland. Results imply that forest ES will be strongly influenced by the direct impact of climate change, but that changes in land use will have a comparatively small impact. The simulation of direct impacts of climate change affects forest ES at all elevations, while land use changes can only be found at high elevations. In contrast, changes to agricultural ES were found to be primarily due to shifts in economic conditions that alter land use and land management. The direct influence of climate change on agriculture is only predicted to be substantial at high elevations, while socioeconomic driven shifts in land use are projected to affect agricultural ES at all elevations. Our simulation results suggest that policy schemes designed to mitigate the negative impact of climate change on forests should focus on suitable adaptive management plans, accelerating adaptation processes for currently forested areas. To maintain provision of agricultural ES policy needs to focus on economic conditions rather than on supporting adaptation to new climate.

Source: http://dx.doi.org/10.1016/j.jenvman.2013.07.018

Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: LandClim

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Security, Precipitation, Temperature

Food/Water Security: Agricultural Productivity, Livestock Productivity

Temperature: Fluctuations

Geographic Feature: ☒

resource focuses on specific type of geography

Mountain

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Switzerland

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☒

format or standard characteristic of resource

Policy/Opinion, Research Article

Resilience: ☒

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Socioeconomic Scenario: Other Socioeconomic Scenario

Other Socioeconomic Scenario: ALUAM

Timescale: ☒

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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